DOCUMENT RESUME

ED 273 496 SE 047 204

TITLE	Secondary Mathematics: Alaska Curriculum Guide. Second Edition.
INSTITUTION	Alaska State Dept. of Education, Juneau. Office of Curriculum Services.
PUB DATE	Aug 86
NOTE	206p.; For the first edition, see ED 265 023; for elementary mathematics curriculum guide, see SE 046 323.
PUB TYPE	Guides - Classroom Use - Guides (For Teachers) (052)
EDRS PRICE	MF01/PC09 Plus Postage.
DESCRIPTORS	Algebra; Calculus; *Educational Objectives; Geometry; Graphs; Mathematical Concepts; *Mathematics Instruction; Secondary Education; *Secondary School Mathematics; State Curriculum Guides; Trigonometry
IDENTIFIERS	*Alaska

ABSTRACT

This is the second edition of a curriculum guide for secondary school mathematics. It is one of a series intended to serve as a model for Alaskan school districts as they develop and review their curriculum documents. Listed are topics and concepts, learning outcomes and objectives, and sample learning activities. The learning activities are indicators of student progress toward the learning outcomes, with at least one sample activity to illustrate each outcome. The preface to this guide discusses the importance of mathematics and presents 14 goals. The mathematics courses, with related topic/concept areas, are listed for: general mathematics, consumer mathematics, pre-algebra, algebra I, algebra II, geometry, trigonometry, pre-calculus, and calculus. Histograms of the cognitive levels of the learning outcomes are provided, showing the percentages of objectives at each level. (MNS)

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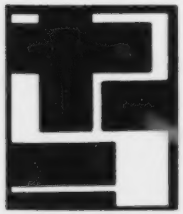
ALASKA

SECONDARY MATHEMATICS

MODEL CURRICULUM GUIDE

Second Edition



August 1986

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SECONDARY MATHEMATICS

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"There cannot be a precise answer to a vague question."

Samuel Johnson

ALASKA MODEL CURRICULUM SERIES

GENERAL PREFACE

Among the many decisions that schools must make, none is more important than the choice of curriculum. Curriculum defines the intent behind instruction and the expectations for student performance. This Second Edition curriculum guide is one of a series intended to serve as a model for Alaskan school districts as they develop and review their own curriculum documents. It is not intended that these guides be used directly by teachers for classroom instructional purposes. Districts are expected to develop their own locally suitable curriculum, using these guides as a base and a point of departure. In the future, as districts use the guides to develop and implement curriculum, their value will be measured by the increased ability of Alaskan students to learn, think, and perform as informed and productive citizens.

In their present form these guides represent a synthesis of input from many sources, both Alaskan and national. They were originally prepared by staff at the Department of Education with the help of professional content associations, Alaskan teachers and administrators. An extensive review and revision process of the first drafts was conducted in 1984-85. School districts, subject matter associations, other professional associations, and interested individuals were part of a revision process that was contracted to the Northwest Regional Educational Laboratory. A panel of nationally recognized curriculum specialists assisted in the original review of each content area. (Contributions to specific guides are listed in the acknowledgments sections of the guides.)

In one sense, these guides will never be finished. It is the intention of the Department of Education that they be dynamic documents, subject to revision as part of the six year curriculum review cycle The state's cycle was initiated by the Department after the curriculum regulations of 1984 were adopted.

Guides exist in the areas of:

Kindergarten	Fine Arts
Language Arts	Social Studies
Science	Computer Education
Foreign Languages	Health
Mathematics	Physical Education

The format of the guides is straightforward but not oversimplified. Each guide lists Topics/Concepts, Learning Outcomes/Objectives, and Sample Learning Activities in three columns.

Topics/Concepts, in the first column, describe the major parts of the subject under consideration. They define broadly the content to be included in the study of each subject area.

Learning Outcomes/Objectives, in the second column, describe, in general terms, the behaviors which students are expected to demonstrate as a result of their learning experiences. Learning outcomes/objectives are the goals toward which student learning is directed.

Sample Learning Activities, shown in the third column, are indicators of student progress toward the stated goals, i.e., the learning outcomes. At least one sample learning activity is stated to illustrate each learning outcome. It is intended that the sample learning activities are just that: samples only. They do not constitute a learning program. Alaskan districts will generate their own locally applicable learning activities within the framework of their district's chosen topics/concepts and learning outcomes.

The guides are grouped by grade level groupings -- grades 1-3, 4-6, 7-8 at the elementary level, and 9-12 at the secondary level. Recognizing the unique characteristics of the five year old learner, kindergarten was prepared as a separate guide. In the development, grades 7-8 were generally seen as the end of the elementary years, but with some beginnings for the secondary level. On the secondary level the guides generally contain discrete one or two semester courses that would be offered; these are not always tied to a particular grade level as the local district must determine the most effective sequence for these courses.

In 1984 the Alaska State Board of Education stated, "The Model Curriculum Guides are intended to serve as a model, not a mandate." They underscored the fact that a partnership between the state and local school districts is crucial. The Board affirmed the need to promote individual variation while stressing the collective responsibility for educating all students in Alaska. It is in this spirit that the Department of Education welcomes the opportunity for continuous collaboration with those interested in the further development and refinement of this entire series of guides.

PREFACE

SECONDARY MATHEMATICS MODEL CURRICULUM GUIDE

A cardinal goal of education is to develop informed, thinking citizens who, armed with the knowledge, attitudes, motivation, self-confidence, and skills to work individually and collectively, can affect positive change in a complex world. Within this context, a primary goal of mathematics education is to foster students' ability to solve problems. Clear and logical thinking is the basis of good mathematical reasoning and is a skill essential to life and to the study of other disciplines. Mathematical literacy and self confidence is required to function effectively in a society in which mathematics is widely used. Sound mathematics education promotes a feeling of efficacy and confidence in situations where reasoning and qualitative thinking are needed. Understanding mathematics also provides the background necessary for a variety of educational and vocational options. Comprehension of mathematics further permits an opportunity to enjoy the intrinsic beauty of mathematical processes.

The major goal of the Alaska Model Curriculum Guide for secondary mathematics is to provide a set of related and specific goals, instructional activities and choice of essential subject matter.

The Learning Outcomes of the Alaska Secondary Mathematics Model Curriculum Guide have been developed to help young people meet the following specific goals:

1. Use the language and symbolism of sets, set operations and their properties.
2. Use the principles of inductive and deductive logic.
3. Measure things using specific units of measure.
4. Use the symbols, elements, operations and functions of whole numbers, integers, rational numbers, real numbers and when appropriate, complex numbers and finite and infinite systems.
5. Solve open sentences.
6. Solve problems using graphs, tables and mathematical statements.
7. Use problem identification, analysis, organization, evaluation, application and generalization to solve real and everyday problems.
8. Value the development of mathematical skills and knowledge.
9. Solve practical problems using mathematical sentences or models and interpret the solution in the context of the problem.

10. Use geometric definitions, postulates and theorems to solve problems.

11. Compute using numbers and algebraic expressions.

12. Describe the importance of counting, measuring, mathematical symbols and systems to historical and cultural development.

13. Use probability and statistics to solve problems.

14. Use calculators, computers, slide rules and other support technology to solve problems.

For each topical area, general topics/concepts are written as broad-based educational goals which lie on a continuum of specificity. The topics/concepts are numbered with whole numbers (e.g. 1.0, 2.0) within each course. The learning outcomes/objectives found in the middle column represent a sequential flow of content matter within each topic and are based on students' developmental levels. Outcome numbers correspond to the topics area and proceed sequentially after the decimal (e.g. 2.10 follows 2.9 and is not equivalent to 2.1). The numbering is used to facilitate cross references to other guides and specific referencing of this guide by districts using it. Sample learning activities are given for the outcomes/objectives statements in the third column and are written in behavioral terms. They also reflect a continuum of specificity, though they are not numbered in the Guide as they are only samples.

Most learners, young children to adults, benefit from using concrete materials when encountering a new concept. In developing each concept or outcome, it is expected that the chosen activities will progress from the concrete use of hands-on material, through pictorial representation and then to abstract symbolization. Learning styles should be taken into consideration in the design of recommended activities. In designing programs, districts should attend to local solutions to the problem of under-representation of females and some minorities in higher-level mathematics courses. While the issue commonly arises at the high school level and creates barriers to career or college study options, it is a K-12 concern and should be addressed as such.

The intent of the sample learning activities is to suggest possible ways students might be able to demonstrate their mastery of the learning outcomes. It is expected that other activities will also be developed at the local level for the same purpose, which will accurately reflect student experiences and abilities, available resources or student needs and interests.

Though all topic areas in the guide are fundamental to accomplishing the specific goals listed above, our lives and society demand emphasis on some areas over others. Several themes should be infused across the other topical areas. As introduced above, the priority throughout mathematics education is problem solving. Problem solving includes, but is not limited to, solving story problems. To the degree feasible, all the concepts should be developed in a problem solving mode. The transfer and application of problem solving from the mathematics classroom to real world situations, is necessary for students to deal successfully with

their world. Estimation and use of mental arithmetic are a integral to problem solving, and are steps in all computation. Judging reasonableness through the use of estimation is a necessary component in meaningful use of calculators and computers. These tools are employed across topics and grade levels. Students should compute efficiently, employing different and appropriate methods in a variety of situations. There is an emphasis on the consumer and real world applications of all mathematics, not only in Consumer Math but as a common theme through the other courses as well. Real world applications are strengthened by cross references to other disciplines. These cross references will be elaborated on in the future as other guides go through the revision process and are sequentially numbered.

At the secondary level, a variety of courses with related topic/concept areas are offered. The topics/concepts covered by each of these are listed below. Local districts will choose the specific order in which they will offer these courses.

SECONDARY MATH COURSES

General Math

- Whole Numbers
- Number Theory
- Fractions
- Decimal Fractions
- Ratio, Proportion and Percent
- Measurement
- Integers
- Graphing
- Probability
- Statistics
- Word Problems
- Career Education
- Calculators and Computers

Consumer Math

- Basic Math Skills
- Estimation
- Graphs
- Decision Making Skills
- Comparison Shopping
- Insurance
- Taxes
- Employment
- Banking
- Credit
- Budgeting
- Investing
- Word Problems
- Probability and Statistics
- Calculators and Computers

Pre-Algebra

- Number Theory
- Fundamental Operations
- Ratio, Proportion and Percent
- Exponents
- Properties
- Square Root
- Scientific Notation
- Integers
- Algebraic Equations and Inequalities
- Measurement
- Graphing
- Operations with Mathemetical Expressions
- Word Problems
- Calculators and Computers

Algebra I

Axioms for Real Numbers
Sets, Numbers, Operations
Relationships of Number Sets
Linear Equations and Inequalities
Linear Systems
Polynomials and Factoring
Calculators and Computers

Algebra II

Rational Algebraic Expressions
Relations and Functions
Quadratic Equations
Logarithms and Exponents
Complex Numbers
Trigonometry
Progression
Calculators and Computers

Geometry

Mathematical System
Reasoning
Points, Lines and Planes
Geometric Figures
Angles
Triangles
Polygons
Geometric Construction
Geometric Proofs
Calculators and Computers

Trigonometry

Complex Numbers
Operations with Complex Numbers
Vectors
Triangle Relationships
Polar Coordinates
Relations and Functions
Function Operations and Graphing
Trigonometric (Circular) Functions
Calculators and Computers

Pre-Calculus

Number Theory
Linear Equations
Mathematical Induction
Number Sentences
Properties and Theorems of Equations
Solving Equations
Nonlinear Equations
Relations and Functions
Function Operations and Graphing
Inverse of a Function
Algebraic Functions
Exponential Functions
Sequences
Series
Limits of Sequences and Series
Calculators and Computers

Calculus

Graphs of Linear Equations
Solving Problems
Solving Equations
Solving and Graphing Inequalities
Relations and Functions
Function Operations and Graphs
Inverse of a Function
Exponential Functions
Logarithmic Functions
Trigonometric (Circular) Functions
Limits
Differential Calculus
Integral Calculus
Calculators and Computers

GENERAL MATH

TOPIC/CONCEPT	LEARNING OBJECTIVE/OUTCOME	SAMPLE LEARNING ACTIVITY
	The Learner will:	
1.0 WHOLE NUMBERS		
	1.1 Read, round and estimate with whole numbers.	
		Name all place values from ones to millions.
		Round off whole numbers to a given place value.
		Estimate sums, differences, products and quotients of whole numbers.
		Order a set of whole numbers from least to greatest.
	1.2 Add, subtract, multiply and divide whole numbers.	
		Use addition, subtraction, multiplication and division algorithms to compute sums, remainders, products and quotients.
		Perform basic computations involving whole numbers.
2.0 NUMBER THEORY	2.1 Demonstrate and differentiate number theory concepts.	
		Differentiate prime and composite numbers.
		Identify the prime factorization of composite numbers and explain its uniqueness.
		Find multiples of a number; identify the least common multiplier (LCM) of a set of whole numbers.

TOPIC/CONCEPT	LEARNING OBJECTIVE/OUTCOME	SAMPLE LEARNING ACTIVITY
	The Learner will:	
3.0 FRACTIONS	3.1 Apply fraction concepts to the solution of problems.	
		Identify equivalent fractions and mixed numbers.
		Compare and order fractions and mixed numbers.
		Add and subtract fractions and mixed numbers.
		Multiply and divide fractions and mixed numbers.
	3.2 Read, write, simplify and order fractions.	
		Represent any fraction in each of the following three models: area/volume, number line and set.
		Use any of the fraction models to demonstrate the equivalence of a set of fractions.
		Give reciprocals of fractions and whole numbers.
		Find the lowest common denominator of a fraction.
4.0 DECIMAL FRACTIONS	4.1 Read, write, round and order decimals.	
		Use reciprocals to find quotients of two fractions.

TOPIC/CONCEPT	LEARNING OBJECTIVE/OUTCOME	SAMPLE LEARNING ACTIVITY
	The Learner will:	
		Read and write decimals to one-hundred thousandths.
		Give place values for any digit in a decimal fraction.
		Apply decimals in science formulas. (See Science Curriculum Guide)
		Round off decimals to any specified place value.
	4.2 Add, subtract, multiply and divide decimals, fractions and mixed numbers.	
		Perform basic computations involving decimal fractions.
		Add or subtract fractions or mixed numbers with a common denominator, and with different denominators.
		Use money transactions to demonstrate an understanding of fractions.
5.0 RATIO, PROPORTION AND PERCENT	5.1 Employ and differentiate ratio, proportion, and percent.	
		Write ratios from sentences and/or problems.
		Use cross products to determine if ratios are equal.

TOPIC/CONCEPT	LEARNING OBJECTIVE/OUTCOME	SAMPLE LEARNING ACTIVITY
	The Learner will:	
		Find missing terms in proportions.
		Solve word problems involving ratios and proportions.
		Solve percent, ratio and proportion problems.
		Rename ratios as decimals and percents and conversely.
		Explain the similarities and differences between "fractions" and "ratios".
6.0 MEASUREMENT	6.1 Use the English and metric systems of measurement.	
		List metric prefixes and their numerical equivalents.
		Estimate the distance between two given points using English or metric units of measurement.
		Use the common metric prefixes milli, kilo and mega in distant and weight measurements.
		Measure the length of any segment using the appropriate English or metric unit of length.
		Determine the length of your pace in meters and measure distances in community by pacing.

TOPIC/CONCEPT	LEARNING OBJECTIVE/OUTCOME	SAMPLE LEARNING ACTIVITY
	The Learner will:	
	6.2 Find perimeter, circumference and area.	Find the perimeter of a polygon given its dimensions. Find the circumference of a circle in terms of pi, using the standard formula. Find the areas of rectangles, triangles and quadrilaterals given appropriate dimensions. Use calipers, triangles and protractors. Calculate the area of a circle using the standard formula and either the radius or diameter.
	6.3 Compute volume and capacity.	Calculate the volume of a rectangular prism, or cylinder using standard formulas. Estimate the capacity of various containers within reasonable limits. Use measurement tools.
	6.4 Find and compare weight (mass).	Estimate the weight (mass) of an object within reasonable limits. Use balance scale to compare weights of classroom supplies such as pencils and pens.

TOPIC/CONCEPT	LEARNING OBJECTIVE/OUTCOME	SAMPLE LEARNING ACTIVITY
	The Learner will:	
	6.5 Solve problems related to time.	
		Calculate the number of days from one date to another.
		Restate the time in hours for number of minutes greater than sixty.
		Calculate the number of hours for a specific number of days.
	6.6 Solve problems related to temperature.	
		Use terms associated with temperature measurement in both Fahrenheit and Celsius scales.
		Measure and compare temperatures using both scales.
	6.7 Solve problems related to energy using watts, horsepower and joules.	
		Compare horsepower generated by a home generator with a village or municipal powerplant.
		Compare energy efficiency and use of household electrical appliances.
7.0 INTEGERS	7.1 Apply and analyze concepts related to integers.	
		List the next largest or smallest integer for any given integer.

TOPIC/CONCEPT	LEARNING OBJECTIVE/OUTCOME	SAMPLE LEARNING ACTIVITY
	The Learner will:	
		Represent the relation of two integers by using a symbol of inequality.
		Describe the concept of absolute value.
		Add, subtract and multiply integers.
		Use a number line to represent and order integers.
8.0 GRAPHING	8.1 Graph in the rectangular coordinate system.	
		Locate and plot points in all quadrants.
		Compute distances between points in the coordinate plane. (See 7th and 8th Grade Science Curriculum.)
	8.2 Convert the data from one type of graph into another type of graph or table.	
		Convert a bar graph into a line graph.
9.0 PROBABILITY	9.1 Demonstrate basic concepts of probability.	
		Conduct simple probability experiments.
		Determine mathematical probabilities of simple events.
	9.2 Solve problems using estimation.	
		Play strategy games.

TOPIC/CONCEPT	LEARNING OBJECTIVE/OUTCOME	SAMPLE LEARNING ACTIVITY
	The Learner will:	
		Role play a problem situation and employ estimation.
10.0 STATISTICS	10.1 Tabulate data and interpret graphs and tables.	
		Use information from graphs and charts to solve problems. (See 7th and 8th Grade Science Curriculum.)
		Construct bar, circle, line or picture graphs to represent numerical data.
		Construct frequency tables from numerical data.
		Interpret graphs and charts and determine frequencies.
		Gather data on the school population and record the information in charts and graphs.
11.0 WORD PROBLEMS	11.1 Solve word problems.	
		Solve an everyday or personal problem using data from charts or graphs.
		Identify different ways to organize and solve problems.
		Use appropriate formulas to solve problems.
		Estimate answers to word problems.

TOPIC/CONCEPT	LEARNING OBJECTIVE/OUTCOME	SAMPLE LEARNING ACTIVITY
	The Learner will:	
		Analyze a solution to determine its fit with a given problem.
	11.2 Solve multiple step word problems to make decisions.	
		In a team, find a route for a traveling sales person so that he/she visits each city in his/her territory only once, returns to starting city, and spends the minimal amount of money.
12.0 CAREER EDUCATION	12.1 Analyze how skills in math relate to employability.	
		Identify and explain the mathematics needed for occupations such as electrician, cashier, food service worker and registered nurse.
		Identify part-time and full-time jobs that require knowledge of math such as metrics, reasoning and geometrical concepts.
		Calculate and display with a line or bar graph, the annual earnings progression of jobs within a company from the lowest paying to the highest paying; calculate the means, medians, and modes of the annual earnings.
		Identify in five, math-related occupations the need and level of responsiveness in the following areas: punctuality, mathematical accuracy, personality, helpfulness.

TOPIC/CONCEPT	LEARNING OBJECTIVE/OUTCOME	SAMPLE LEARNING ACTIVITY
	The Learner will:	
		Analyze effects of number of years of education and level of knowledge of math on salary.
13.0 CALCULATORS AND COMPUTERS	13.1 Use common calculating devices.	
		Use math tables and a calculator to solve problems.
	13.2 Use a computer to solve problems.	
		Use the vocabulary, definitions and operational procedures associated with computers and their peripherals as appropriate to needs and interests. (See also Secondary Computer Education Curriculum Guide.)
		Prepare a report on jobs where calculators and computers are used.

CONSUMER MATH

TOPIC/CONCEPT	LEARNING OBJECTIVE/OUTCOME	SAMPLE LEARNING ACTIVITY
	The Learner will:	
1.0 BASIC MATH SKILLS	1.1 Compute whole numbers, fractions and decimals as an aid to solving consumer math problems.	Add, subtract, multiply and divide whole numbers, fractions, decimals, ratios and percents as they occur in consumer math problems.
2.0 ESTIMATION	2.1 Estimate to solve consumer math problems.	Identify occupations and every day situations that use estimation. Estimate results after being given necessary data to solve consumer math problems. Estimate answers by rounding the figures involved and calculating with the rounded numbers.
3.0 GRAPHS	3.1 Use line, bar and circle graphs as aids to solving consumer math problems.	Visualize a floor plan or map in response to verbal direction or a garment from a flat pattern. Draw, read and apply line, bar, and circle graphs to the solution of consumer math problems.

TOPIC/CONCEPT	LEARNING OBJECTIVE/OUTCOME	SAMPLE LEARNING ACTIVITY
	The Learner will:	
		Draw a circle graph showing given percentages and ratios applicable to solving consumer math problems.
		Read and interpret graphs from a newspaper.
4.0 DECISION MAKING SKILLS	4.1 Assess the considerations involved in making a large purchase.	
		Compare costs of purchasing a used car, three wheeler, snow machine, boat, or appliance with the costs of purchasing a new car (or appliance).
		Apply the need and cost variables to determine the best choice between two or more options involving the purchase of a snow machine or large appliance.
		Calculate the monthly payments given the total cost and terms of credit.
		Calculate sales tax given the list price and the percent of tax.
		List and calculate the operating costs of a car or large appliance.
		Calculate miles per gallon and cost per mile, or miles in a river system.

TOPIC/CONCEPT	LEARNING OBJECTIVE/OUTCOME	SAMPLE LEARNING ACTIVITY
	The Learner will:	
	4.2 Determine living costs.	Calculate living costs including food, transportation, shelter, insurance, etc. Calculate the costs of purchasing a home including down payment and amount to be financed, given the list price of a home and percent of down payment. Calculate the costs involved in maintaining a home. List alternative housing choices and calculate the monthly costs of each. Calculate the cost of utilities.
	4.3 Determine future education costs.	Determine the cost of attending a college or training program in preparation for each of two possible careers; select different alternatives to meet the financial needs associated with further education or training.
5.0 COMPARISON SHOPPING		
	5.1 Practice ordering from a catalog.	Complete an order form, including shipping charges and taxes from a mail order catalog. Evaluate store buying vs. catalog buying.

TOPIC/CONCEPT	LEARNING OBJECTIVE/OUTCOME	SAMPLE LEARNING ACTIVITY
	The Learner will:	
		Calculate a sale price when a discount is offered.
	5.2 Organize a budget.	
		Design a budget.
		Determine transportation costs of items to a village when calculating comparative costs between village store prices and catalog prices.
	5.3 Know how to get the best buy in a supermarket, or local store.	
		Calculate unit price.
		Calculate the better buy, given two different sizes of packaged products of equal quality.
		Calculate the cost per item, given the price of a multiple purchase.
6.0 INSURANCE	6.1 Explain and assess different types of insurance and their purposes.	
		List and define the various types of life and car insurance.
		List and define the various types of insurance coverages pertaining to home owner and renter protection.

TOPIC/CONCEPT	LEARNING OBJECTIVE/OUTCOME	SAMPLE LEARNING ACTIVITY
	The Learner will:	
		Calculate the insurance premium for different types of car insurance, given necessary variables such as age, sex, marital status, use of car and geographic location.
7.0 TAXES	7.1 Be able to complete federal income tax forms.	
		Define the terminology used in preparing federal income tax forms.
		Select an appropriate form given specific information.
		Complete short and long tax forms, given necessary information.
		Calculate personal income tax.
8.0 EMPLOYMENT	8.1 Determine prospective job opportunities.	
		Identify possible job opportunities from the classified ads.
		List alternatives for identifying job opportunities and analyze the advantages and disadvantages of each.
		Complete an employment form.
	8.2 Calculate earnings.	
		Define the following: piece work, commission, hourly, weekly and monthly wages.

TOPIC/CONCEPT	LEARNING OBJECTIVE/OUTCOME	SAMPLE LEARNING ACTIVITY
	The Learner will:	
		Examine the earnings and costs of leaving your home to work two weeks on/two weeks off.
		Calculate earnings based on hourly, weekly or monthly wages.
		Interpret a payroll stub.
	8.3 Solve math problems related to occupations that use math skills.	
		Solve math problems related to business, technical or construction careers.
		Inventory occupations to learn what occupations use math skills.
9.0 BANKING	9.1 Be able to explain and use various types of checking and savings accounts.	
		List and describe various types of checking accounts.
		Fill out a deposit slip, check and check stub.
		Fill out necessary paperwork for a postal money order.
		Reconcile a checking account, given a bank statement and cancelled checks.
		Calculate the interest on a savings account, given the principal and rate of interest.

TOPIC/CONCEPT	LEARNING OBJECTIVE/OUTCOME	SAMPLE LEARNING ACTIVITY
	The Learner will:	
10.0 CREDIT	10.1 Explain various types of credit and how to use credit wisely.	Identify the types of credit available to consumers. Calculate the interest associated with credit buying.
11.0 BUDGETING	11.1 Develop a workable budget.	Determine the amount allocated to each category of a family budget, given net income and a circle graph showing percentages of expenditures. Develop a workable budget given net income and identified expenses.
12.0 INVESTING	12.1 Evaluate various ways to invest money.	State the difference between stocks, bonds and certificates of deposit. Report on investment possibilities of the following: stocks, bonds, certificates of deposit, real estate, treasury bills, precious metals. Examine the shareholder investments of an Alaskan village corporation.
13.0 WORD PROBLEMS	13.1 Solve word problems related to consumer situations.	Use pictorial or graphic representations as aids in solving consumer-related problems.

TOPIC/CONCEPT	LEARNING OBJECTIVE/OUTCOME	SAMPLE LEARNING ACTIVITY
	The Learner will:	
		Solve consumer-related problems in which part of the information is contained in pictures or charts.
		Solve word problems involving more than one step or operation.
		Engage in cooperative problem solving.
		Identify different ways to organize and solve consumer-related problems.
		Determine if a solution fits a given consumer-related problem.
14.0 PROBABILITY AND STATISTICS	14.1 Explain how knowledge of probability and statistics affects the consumer.	
		Report on various games of chance to determine if gambling pays.
		Demonstrate sampling and predict from given samples.
15.0 CALCULATORS AND COMPUTERS	15.1 Use a calculator as an aid to solving consumer math problems.	
		Prepare a report on careers that use calculators and computers. (See also Secondary Computer Education Curriculum Guide.)

TOPIC/CONCEPT	LEARNING OBJECTIVE/OUTCOME	SAMPLE LEARNING ACTIVITY
	The Learner will:	
		Add, subtract, multiply and divide with a calculator to solve consumer related problems.
		Figure percentages, averages, square roots on a calculator to help solve consumer related problems.
		Demonstrate the use of the memory and all standard functions of a calculator.
		Calculate the costs of alternative forms of transportation.
	15.2 Use a computer to solve problems.	
		Use the vocabulary, definitions and operational procedures associated with computers and their peripherals as appropriate to needs and interests.

PRE-ALGEBRA

TOPIC/CONCEPT	LEARNING OBJECTIVE/OUTCOME	SAMPLE LEARNING ACTIVITY
	The Learner will:	
1.0 NUMBER THEORY	1.1 Factor whole numbers.	Identify numbers which are prime and those which are composite. List all possible factors of a set of composite numbers. Find the prime factorization of a composite number. Apply the rules of divisibility to determine whether or not a number is divisable by two, three, four, five, six, nine or ten. Find the Lowest Common Multiple (LCM) for a set of numbers. Find the Greatest Common Factor (GCF) for a set of numbers.
2.0 FUNDAMENTAL OPERATIONS	2.1 Perform operations with fractions and decimal fractions.	Add, subtract, multiply and divide fractions and decimal fractions. Write equivalent expressions for the conversion of fractions to decimals; decimals to fractions; fractions to percents; percents to fractions; decimals to percents; percents to decimals.

TOPIC/CONCEPT	LEARNING OBJECTIVE/OUTCOME	SAMPLE LEARNING ACTIVITY
	The Learner will:	
		Identify applications of fraction operations in everyday life and jobs.
		Round whole numbers or decimals to any place value.
		Estimate the sum, difference, product or quotient of whole numbers or decimals.
3.0 RATIO, PROPORTION, AND PERCENT	3.1 Apply ratio and proportion.	
		List examples of equivalent ratios.
		Solve problems involving proportion.
	3.2 Solve problems involving percent.	
		Calculate a given percent of any number.
		Solve word problems involving discount or simple interest.
4.0 PROPERTIES	4.1 Demonstrate properties of numbers.	
		Demonstrate how to use the following: commutative properties of addition and multiplication; associative properties of addition and multiplication; additive identity; multiplication property of zero; multiplication identity; distributive property.

TOPIC/CONCEPT	LEARNING OBJECTIVE/OUTCOME	SAMPLE LEARNING ACTIVITY
	The Learner will:	
5.0 EXPONENTS, SQUARES AND SCIENTIFIC NOTATION		
	5.1 Use exponents.	
		Rewrite the value using an exponent for a group of like factors.
		Rewrite a number in exponential form in expanded notation.
		Calculate the value of the number, given a number a^n where a and n are natural numbers.
	5.2 Use and determine squares and square root.	
		State the principal square root for a natural number less than 150 which is a perfect square.
		Determine the approximate square root of any natural number using appropriate tables.
	5.3 Use scientific notation.	
		Write in decimal notation the value of a number given in scientific notation.
6.0 INTEGERS	6.1 Apply the concept of integers.	
		State the opposite of an integer other than zero.
		Order integers, using correct symbols.

TOPIC/CONCEPT	LEARNING OBJECTIVE/OUTCOME	SAMPLE LEARNING ACTIVITY
	The Learner will:	
		Add, subtract, multiply and divide integers.
		Define and determine absolute values of integers.
7.0 ALGEBRAIC EQUATIONS AND INEQUALITIES	7.1 Put together algebraic form and simple linear inequalities.	
		Translate statements from written form to algebraic form and conversely.
		Solve algebraic equations.
		Solve simple linear inequalities.
	7.2 Analyze a problem situation with a number sentence.	
		Replace variables with numbers to make open sentences true.
		Identify math sentences as true, false or open.
8.0 MEASUREMENT	8.1 Find perimeter, area and volume.	
		Find the perimeters of polygons and the circumferences of circles.
		Find the areas of polygons and circles.
		Find the surface areas of prisms, cylinders and pyramids.
		Find the volumes of prisms, cylinders, pyramids, spheres and cubes.

TOPIC/CONCEPT	LEARNING OBJECTIVE/OUTCOME	SAMPLE LEARNING ACTIVITY
	The Learner will:	
9.0 GRAPHING	9.1 Graph on number lines and coordinate planes.	
		Graph wildlife population numbers over time.
		Label the points of a graph as points on the plane.
		Graph linear equations in two variables on the coordinate plane.
	9.2 Interpret information presented on a graph.	
		Use graph scales of varying degrees of magnitude.
		Determine the maximum and minimum values represented on a graph.
		Explain the scale used on a graph.
		List the area or region representing the greatest or least change for any graph.
		Define a linear growth curve and an exponential growth curve.
	9.3 Collect, organize and display data on a graph.	
		Collect numerical data for a selected topic and talley the distribution.

TOPIC/CONCEPT	LEARNING OBJECTIVE/OUTCOME	SAMPLE LEARNING ACTIVITY
	The Learner will:	
		Represent collected data on a bar, line or circle graph.
		Analyze given data and find the range, mean, mode and median.
10.0 OPERATIONS WITH MATHEMATICAL EXPRESSIONS	10.1 Perform operations that involve mathematical expressions.	
		Simplify mathematical expressions.
		Evaluate expressions given the numerical values for variables.
		Add and subtract polynomials.
11.0 WORD PROBLEMS	11.1 Solve word problems.	
		Use pictorial or graphic representations as aids in solving problems.
		Distinguish relevant information when solving word problems.
		Solve problems involving more than one step or operation.
		Identify different ways to organize and solve problems.

TOPIC/CONCEPT	LEARNING OBJECTIVE/OUTCOME	SAMPLE LEARNING ACTIVITY
	The Learner will:	
		Estimate answers to word problems.
		Analyze a solution to determine its fit with a given problem.
12.0 CALCULATORS AND COMPUTERS	12.1 Use calculating devices to solve problems.	
		Use tables and calculators as tools in solving problems. (See also Secondary Computer Education Curriculum Guide.)
	12.2 Use a computer to solve problems.	
		Use the vocabulary, definitions and operational procedures associated with computers and their peripherals as appropriate to needs and interests.
	12.3 Judge the reasonableness of a computation performed on a calculator or computer.	
		Choose the most reasonable solution to problems from a set of options.

ALGEBRA I

TOPIC/CONCEPT	LEARNING OBJECTIVE/OUTCOME	SAMPLE LEARNING ACTIVITY
	The Learner will:	
1.0 AXIOMS FOR REAL NUMBERS	1.1 Use and categorize algebraic symbols.	Identify the meaning of the following symbols used for mathematical operations: -, +, x, -
		Recognize the symbols which are used for grouping in algebra (e.g., parentheses, brackets, braces).
		Identify symbols used for ordering and in set notation.
2.0 SETS, NUMBERS, OPERATIONS	2.1 Perform basic set operations.	Define the meanings of the following terms used to describe sets: null, subset, finite, and disjoint.
		Define sets by listing and by description.
		Define the following set operations: union, intersection.
	2.2 Analyze basic set operations.	Show set operations using Euler circles, mappings and/or Venn diagrams.
	2.3 Evaluate properties which are true for an operation or operations on given subsets of real numbers.	Define the property of closure, and the Associative and Commutative properties.

TOPIC/CONCEPT	LEARNING OBJECTIVE/OUTCOME	SAMPLE LEARNING ACTIVITY
	The Learner will:	
		Demonstrate how to use the identity element.
		Explain how to use the identity element in sets containing inverse elements.
		Demonstrate how subtraction and division are neither associative nor commutative.
	2.4 Explain the relationship between an operation and its inverse.	
		Express the difference of two integers a and b as the sum of a and the "opposite" (additive inverse) of b; $a - b = a + (-b)$.
		Explain that raising a number to the nth power, where n is a positive integer, and finding the nth root are inverse operations.
	2.5 Demonstrate the properties of equalities.	
		Give examples of the following properties: reflexive, transitive, symmetric, additive, multiplicative.
		Demonstrate the Trichotomy Law.
	2.6 Demonstrate the properties of inequalities.	
		Restate the following properties of inequalities and present examples of each: transitive, additive, multiplicative.

TOPIC/CONCEPT	LEARNING OBJECTIVE/OUTCOME	SAMPLE LEARNING ACTIVITY
	The Learner will:	
		Demonstrate that for real numbers a and b, $a > b$ if and only if $a - b > 0$.
		Demonstrate that the product of two real numbers is zero if and only if one or both of the factors are zero.
		Describe division by zero as undefined.
3.0 RELATIONSHIPS OF NUMBER SETS	3.1 Describe different numbering systems.	
		Define natural, whole, rational, irrational, real, imaginary and complex numbers.
	3.2 Recognize the forms that indicate the types of variations needed to solve problems.	
		Recognize which type of variation is needed to solve a problem (e.g., direct, indirect, inverse, joint or combined).
		Use direct variation to solve a problem.
4.0 LINEAR EQUATIONS AND INEQUALITIES	4.1 Rate the characteristics of linear equations and inequalities.	
		Determine the equivalent of an inequality of the form $ax + b > c$.

TOPIC/CONCEPT	LEARNING OBJECTIVE/OUTCOME	SAMPLE LEARNING ACTIVITY
	The Learner will:	
	4.2 Graph the solutions of inequalities involving absolute values.	Define absolute value. Graph equations involving absolute value. Graph inequalities. Solve equations involving absolute value.
	4.3 Classify and graph functions.	Classify examples of functions (e.g., constant, linear, quadratic, exponential, trigonometric). Sketch the linear graph for a function f, with numbers m and b such that $f(x) = mx+b$. Describe a polynomial function as a function defined by a polynomial in one variable of any degree. Explain that a rational function is a quotient of two polynomial functions.
	4.4 Graph exponential functions.	Solve and graph exponential functions.
	4.5 Demonstrate logarithms.	Define a logarithmic function as the inverse of an exponential function.

TOPIC/CONCEPT	LEARNING OBJECTIVE/OUTCOME	SAMPLE LEARNING ACTIVITY
	The Learner will:	
		Graph the inverse of a relation.
		Graphically represent a polynomial function.
		Graph rational functions.
		Evaluate and graph exponential functions.
		Perform fundamental arithmetic operations on functions and determine the domain and range of the new function.
		Solve a word problem whose solution depends on the knowledge of relations and functions.
		Use knowledge of relations and functions to design and solve real life problems.
5.0 LINEAR SYSTEMS	5.1 Solve systems of two equations in two variables.	
		Define a linear system.
		Solve a system of two equations in two unknowns by graphing.
		Solve a system of two equations in two unknowns using elimination or substitution.
		Solve a system of two equations in two unknowns using determinants (Cramer's Rule).

TOPIC/CONCEPT	LEARNING OBJECTIVE/OUTCOME	SAMPLE LEARNING ACTIVITY
	The Learner will:	
	5.2 Solve systems of three linear equations in three variables.	Solve a system of three equations having three variables using elimination or substitution method. Solve a system of three linear equations having three variables using determinants (Cramer's Rule). Explain the rationale used by a computer program to solve large systems of equations and inequalities.
	5.3 Solve problems whose solutions depend on a knowledge of open sentences.	Translate a word problem into an open sentence and the converse.
	5.4 Explain various types of solution sets possible for a system of n linear equations in n variables.	Explain that a system of n linear equations in n variables may have the following: (1) an empty solution set (inconsistent); (2) a single member in its solution set (consistent and independent); (3) infinitely many members in its solution set (consistent and dependent).

TOPIC/CONCEPT	LEARNING OBJECTIVE/OUTCOME	SAMPLE LEARNING ACTIVITY
	The Learner will:	
	5.5 Recognize a graph of equations in an inconsistent system of two linear equations in two variables or three in three variables.	
		Predict that graphs of an inconsistent system of two linear equations in two variables or in three variables may consist of the following: (1) two parallel lines, three parallel lines, (2) two coincident planes parallel to a third plane; (3) three planes intersecting in three parallel lines; (4) two parallel planes intersecting a third plane.
		Sketch a sample of each of the graphs in the preceding.
	5.6 Graph a system of linear equations.	
		Explain that points in a Cartesian 3-space map one-to-one onto and/or into the set of ordered triples of real numbers.
		Sketch the graphs of space figures, including their traces in three mutually perpendicular planes.
		Define linear programming as the solution of systems of linear inequalities with linear constraints for maximum or minimum outcomes.

TOPIC/CONCEPT	LEARNING OBJECTIVE/OUTCOME	SAMPLE LEARNING ACTIVITY
	The Learner will:	
6.0 POLYNOMIALS AND FACTORING	6.1 Explain and analyze terms associated with polynomials.	
		Define the following terms: monomial, binomial, trinomial, polynomial, degree, literal, coefficient, variable, constant, factor, common.
		Classify a polynomial by the number of terms, by degree or by the nature of the coefficients.
	6.2 Use polynomials in computation.	
		Perform the four basic operations on polynomials.
		Simplify polynomial expressions (collect common terms).
		Order a polynomial in the standard form (e.g., ascending order of terms).
	6.3 Factor polynomial expressions.	
		Apply the distributive law to factoring and multiplying polynomials.
		Define "factoring a polynomial over a set."
		Factor non-prime second degree polynomials of the form $ax^2 + bx + c$ and $ax^2 + bxy + cy^2$ over a given set.

TOPIC/CONCEPT	LEARNING OBJECTIVE/OUTCOME	SAMPLE LEARNING ACTIVITY
	The Learner will:	
		Factor polynomials by inspection (e.g., perfect square trinomials, difference of two squares, the sum or difference of two cubes).
		Apply the Factor Theorem to find and verify factors of a polynomial.
		Apply the Remainder Theorem and synthetic substitution to evaluate a polynomial for any real number.
		Apply the Rational Root Theorem to polynomial equations to find rational roots.
7.0 CALCULATORS AND COMPUTERS	7.1 Use a computer to solve problems.	
		Use the vocabulary, definitions and operational procedures associated with computers and their peripherals as appropriate to needs and interests. (See also Secondary Computer Education Curriculum Guide.)
	7.2 Use calculating devices to solve problems.	
		Use tables and calculators as tools in solving problems.

ALGEBRA II

TOPIC/CONCEPT	LEARNING OBJECTIVE/OUTCOME	SAMPLE LEARNING ACTIVITY
	The Learner will:	
1.0 RATIONAL ALGEBRAIC EXPRESSIONS	1.1 Understand and use rational algebraic expressions.	
		Express an integer in fraction form. Define a rational expression as the quotient of two polynomials (P1 divided by P2 where P2 is not zero).
		Add, subract, multiply and divide rational expressions.
		Recognize the simplest form of a rational expression.
		Simplify rational algebraic expressions, including those with nonintegral exponents.
		Identify the reciprocal multiplication inverse of any rational number except zero.
		Describe the decimal representation of rational numbers as terminating or infinitely repeating.
		Describe the decimal representation of irrational numbers as infinitely non-repeating.
2.0 RELATIONS AND FUNCTIONS	2.1 Form functions and relations.	
		Define relation, function, domain, range and inverse.

TOPIC/CONCEPT	LEARNING OBJECTIVE/OUTCOME	SAMPLE LEARNING ACTIVITY
	The Learner will:	
		Use standard notation associated with functions.
		Solve for f(g(x)) for any value of x which yield a g(x) in the domain of f (given two functions of f and g).
	2.2 Form inverse functions.	
		Recognize if the inverse of a function is a function.
		Given the graph of a function, state whether its inverse is also a function.
3.0 QUADRATIC EQUATIONS	3.1 Explain and put together the general form of a quadratic equation in one or two variables.	
		Generate the general form of a quadratic equation in one or two variables.
		Identify the discriminant for a quadratic formula.
		Use the discriminant to describe the roots of a quadratic equation.
		Explain that the product of two or more expressions is zero if and only if one of the expressions is zero.

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TOPIC/CONCEPT	LEARNING OBJECTIVE/OUTCOME	SAMPLE LEARNING ACTIVITY
	The Learner will:	
		Verify the roots of an equation (e.g., by the "sums and products" method for equations of the degree less than or equal to 2).
		Graph quadratic relations or functions (equalities or inequalities).
		Determine the solution for an equation with one variable, one term of which contains a radical with the unknown in the radicand.
	3.2 Demonstrate the basic ideas associated with conic sections.	
		Define conic sections.
		Define terms related to conics (e.g., cone, intersection, circle, hyperbola, major axis, eccentricity, vertices, asymptotes).
	3.3 Graph standard quadratic equations.	
		Identify the graph for an equation $y = x^2 + c$ as a parabola.
		Describe and compute the vertex, orientation and steepness of a parabola given an equation of the form $ax^2 + bx + c = 4$.
		Describe the method for sketching the graph of a parabola.

TOPIC/CONCEPT	LEARNING OBJECTIVE/OUTCOME	SAMPLE LEARNING ACTIVITY
	The Learner will:	
		Recognize the graph of an equation $ay^2 + ay^2 = b$, where a and b = 0, as a circle.
		Identify the center and the radius, given an equation of a circle of the form $ax^2 + bx + ay^2 + dy + e = 0$.
		Sketch the graph of a circle.
		Sketch the graph of an ellipse.
		Recognize the equation of an ellipse.
		Write the equation of a specific ellipse, given its location, orientation, shape and size.
		Sketch the graph of a hyperbola.
		Graph the hyperbola, given the equation.
		Write the equation for the hyperbola, given its graph.
		Find the asymptotes of a hyperbola.
	3.4 Solve systems of equations involving conic sections.	
		Use the definition of conic section to derive equations for respective sections.

TOPIC/CONCEPT	LEARNING OBJECTIVE/OUTCOME	SAMPLE LEARNING ACTIVITY
	The Learner will:	
		Recognize and name the type of conic section represented, given an equation of the form $ax^2 + by^2 + cy + dy + e = 0$.
		Find the solution graphically and algebraically for a system of two equations.
4.0 LOGARITHMS AND EXPONENTS	4.1 Explain logarithmic functions and apply this knowledge to the solution of problems.	
		Define the terms used in working with logarithms (e.g., characteristic, interpolation, base, exponent).
		Define common and natural logarithms.
		Translate the exponential statement of equality into logarithmic form.
	4.2 Estimate the answers to arithmetic problems of multiplication, division root extraction, and raising to powers using logarithms.	
		List the laws of logarithmic functions.
		Use logarithms to perform the operations of multiplication and division.
		Use linear interpolation for approximation from a table of mantissas.

TOPIC/CONCEPT	LEARNING OBJECTIVE/OUTCOME	SAMPLE LEARNING ACTIVITY
	The Learner will:	
		Raise a number to a stated power by using the properties of logarithms.
		Describe scientific notation in general terms and give a specific example.
		Describe logarithmic function as the inverse of an exponential function.
		Find the antilogarithm of a number.
	4.3 Explain and use exponential notation.	Define bn when n is (1) a rational number; (2) zero; (3) a negative integer; (4) a rational number in fraction form.
		Explain that finding the root of a positive integer is the inverse operation of raising it to a power.
		Use the definition of laws of exponents to simplify computation.
5.0 COMPLEX NUMBERS	5.1 Describe and generate complex numbers.	Define i as $\sqrt{-1}$.
		Express a complex number in the standard form a + bi.
		Show a graphic representation in a rectangular and/or polar coordinate system.

TOPIC/CONCEPT	LEARNING OBJECTIVE/OUTCOME	SAMPLE LEARNING ACTIVITY
	The Learner will:	
		Describe the subset relationship of real and complex numbers.
	5.2 Compute using complex numbers.	
		Define the basic operations for complex numbers (division, multiplication, addition, subtraction).
		Determine the sum of two or more complex numbers and simplify to a + bi form (a, b, real numbers).
		Find the absolute value of a complex number.
		Find the conjugate of a complex number.
	5.3 Compute polynomial equations over the set of complex numbers.	
		Analyze an equation to determine if it has complex roots.
		Graph an equation to determine if it has complex roots.
		Verify the roots of an equation.
6.0 TRIGONOMETRY	6.1 Define trigonometric functions of an angle in terms of a right triangle or a point in the coordinate plane.	
		Define the terms associated with angles (e.g., standard position, initial side, terminal side, sign, magnitude quadrant).

TOPIC/CONCEPT	LEARNING OBJECTIVE/OUTCOME	SAMPLE LEARNING ACTIVITY
	The Learner will:	
		Explain the idea that all trigonometric functions of an angle are determined by a point on the terminal side of the angle in standard position.
		Describe the domain and range for circular functions (i.e., sine, cosine, tangent, cotangent, secant, cosecant).
	6.2 Relate the trigonometric function and the circular function of real numbers through the radian measure of angles.	
		State that the value of a trigonometric function of an angle whose measure is 0 radians is equal to the value corresponding to the circular function of the real number 0.
		Explain that a central angle of a circle and the arc length intercepted by the angle are related.
	6.3 Graph circular (trigonometric) functions.	
		Determine the domain and range of a trigonometric function.
		Sketch the characteristics of circular (trigonometric) functions (e.g., period, amplitude, phase, shift or angle).

TOPIC/CONCEPT	LEARNING OBJECTIVE/OUTCOME	SAMPLE LEARNING ACTIVITY
	The Learner will:	
	6.4 Define and prove fundamental identities of the (trigonometric) functions.	
		State the fundamental identities of circular functions.
		Prove identities using fundamental circular (trigonometric) identities.
	6.5 Solve problems related to oblique and right triangles.	
		State the conditions which determine the number of solutions for a triangle problem.
		Solve problems involving right triangles using trigonometric functions.
		Solve problems involving oblique triangles using the trigonometric functions (e.g., law of sines and cosines).
		Solve circular (trigonometric) equations.
		Use computational and measuring devices to aid in the solution of trigonometry problems.
7.0 PROGRESSION	7.1 Demonstrate arithmetic and geometric progressions.	
		Define sequence and series and demonstrate proper use of notation.

TOPIC/CONCEPT	LEARNING OBJECTIVE/OUTCOME	SAMPLE LEARNING ACTIVITY
	The Learner will:	
		Determine the sum of an infinite geometric series.
		Find the nth term of an arithmetic or geometric sequence.
	7.2 Recognize and use the Binominal Theorem.	
		Recognize the patterns exhibited by coefficients and exponents when binomials are expanded.
		State the relationship between the coefficients in the binomial expansion and Pascal's triangle.
		Expand binomials using Pascal's triangle and the Binomial Theorem.
		Find the nth term of a binomial expansion.
		Solve a simple probability problem using the Binomial Theorem.
8.0 CALCULATORS AND COMPUTERS	8.1 Use a computer to solve problems.	
		Use the vocabulary, definitions and operational procedures associated with computers and their peripherals as appropriate to needs and interests. (See also Computer Education Curriculum Guide.)

TOPIC/CONCEPT	LEARNING OBJECTIVE/OUTCOME	SAMPLE LEARNING ACTIVITY
	The Learner will:	
	8.2 Use calculating devices to solve problems.	Use tables and calculators as tools in solving problems.

GEOMETRY

TOPIC/CONCEPT	LEARNING OBJECTIVE/OUTCOME	SAMPLE LEARNING ACTIVITY
	The Learner will:	
1.0 MATHEMATICAL SYSTEM	1.1 Define and use mathematical systems.	Define "model" as an abstract system for understanding practical and/or hypothetical situations. Describe geometry as a structured model of physical space dealing with sizes and shapes. State how theorems are used in the geometrical system.
2.0 REASONING	2.1 Differentiate between inductive and deductive reasoning.	Define reasoning and give an example of its use in our lives. Determine whether the inductive or deductive process was used in a given example. Describe an everyday life situation in which inductive reasoning would be most appropriate.
	2.2 Differentiate the characteristics of conditional, converse, inverse and contrapositive statements.	Give an example of a conditional statement. Label the hypotheses and the conclusion of a conditional statement.

TOPIC/CONCEPT	LEARNING OBJECTIVE/OUTCOME	SAMPLE LEARNING ACTIVITY
	The Learner will:	
		Write the converse, inverse, and contrapositive of a conditional statement.
3.0 POINTS, LINES AND PLANES	3.1 Demonstrate undefined terms of the geometric system.	
		State the difference between defined and undefined terms.
	3.2 Explain and apply the relationships among points, lines and planes.	
		Demonstrate by construction the relationships among points, lines and planes.
		Identify the points, lines and planes of a set of geometric figures. Define ray, end point, half line and half plane.
		Explain that two points determine a line and three non-collinear points determine a plane.
		Explain that two intersecting lines or two parallel lines determine a plane.
		Sketch an example of intersecting lines.
		Graph two lines from their equations to show whether they are parallel or intersecting.

TOPIC/CONCEPT	LEARNING OBJECTIVE/OUTCOME	SAMPLE LEARNING ACTIVITY
	The Learner will:	
	3.3 Explain and measure rays and segments.	Label correctly: a) opposite rays; b) parallel rays and/or segments; c) intersecting rays and/or segments; d) the union of rays and/or segments; and e) midpoint of a segment. Calculate the length of a line segment, given the coordinates of the endpoints.
	3.4 Demonstrate the concept of betweenness.	Determine the lengths of the coordinates of three distinct linear points and tell which is between the other two. Verify that B is between A and C by using the definition of betweenness AB + BC = AC, given the points A, B, and C.
4.0 GEOMETRIC FIGURES	4.1 Recognize geometric figures.	Identify closed geometric figures in a plane (e.g., triangle, polygon, polyhedron, sphere, octagon, hexagon). Describe naturally occurring examples of the closed geometric figures mentioned in the preceding (e.g., spider's web, crystalline structures).

TOPIC/CONCEPT	LEARNING OBJECTIVE/OUTCOME	SAMPLE LEARNING ACTIVITY
	The Learner will:	
5.0 ANGLES	5.1 Apply the postulates and theorems of angles.	
		Demonstrate that every angle has exactly one bisector.
		Sketch acute, obtuse, right and dihedral angles.
	5.2 Identify, measure and label angles.	
		Identify the vertex and the rays of an angle.
		Demonstrate the three methods of naming and labeling an angle.
		Define the following relationships between angles: supplementary, complementary, linear pair, vertical, interior, exterior.
		Use a protractor to measure an angle.
		Determine the measure of any angle, given a diagram of two parallel lines intersected by a transversal and the measure of one angle.
		Measure angles to solve a practical problem (e.g., carpentry).
6.0 TRIANGLES	6.1 Identify and classify triangles.	
		Classify triangles as scalene, isosceles, or equilateral.
		Identify the following from a given vertex: a) angle bisector; b) median; c) altitude.

TOPIC/CONCEPT	LEARNING OBJECTIVE/OUTCOME	SAMPLE LEARNING ACTIVITY
	The Learner will:	
	6.2 Explain and use congruency theorems.	Define congruent, and describe corresponding parts of congruent geometric figures as congruent. Prove two triangles are congruent by one of the following methods: a) side, angle, side (SAS); b) side, side, side (SSS); c) angle, side, angle (ASA); or d) angle, angle, side (AAS). Prove two right triangles are congruent by one of the following methods: a) hypotenuse, leg (HL); b) hypotenuse, angle (HA); c) leg, angle (LA); or d) leg, leg (LL).
	6.3 Apply the triangle inequality theorems and the relationships between sides and angles.	Apply theorems concerning inequalities in two triangles, using the "Hinge Theorem" and its converse.
	6.4 Perform measurements related to triangles.	Use the fact that the sum of the interior angles of a triangle is 180 degrees to solve problems. Demonstrate that the side opposite the larger angle is the longest side.

TOPIC/CONCEPT	LEARNING OBJECTIVE/OUTCOME	SAMPLE LEARNING ACTIVITY
	The Learner will:	
		Determine the measure of the third angle of a triangle, given the measures of the other two angles.
		Calculate the area of a triangle.
		Use the Pythagorean Theorem to solve problems involving right triangles.
	6.5 Explain and assess the conditions that must be established to demonstrate similarity between geometric figures.	
		Demonstrate that corresponding sides of similar geometric figures are proportional to each other.
		Define means, extremes, mean proportional, terms of proportion, and constant of proportionality.
7.0 POLYGONS	7.1 Identify, classify and measure quadrilaterals.	
		Classify quadrilaterals as trapezoid, parallelogram, rhombus, rectangle or square.
		Calculate the area of a quadrilateral.
	7.2 Explain and apply the theorem and definitions regarding circles.	
		Define the terms related to circles.

TOPIC/CONCEPT	LEARNING OBJECTIVE/OUTCOME	SAMPLE LEARNING ACTIVITY
	The Learner will:	
		Construct drawings to illustrate secants, tangents, chords, diameters, and radii.
		Find the measurement of angles and segments formed by chords, secants and tangents of circles.
		Use the area and circumference formulas of circles to find the area, radius, circumference or diameter of a circle.
		Determine the measure of angles or related arcs of a circle.
		Make drawings to illustrate central angles and inscribed angles.
		Classify circles as a) concentric; b) internally tangent; c) externally tangent; d) nonintersecting; or e) intersecting at two points.
8.0 GEOMETRIC CONSTRUCTION	8.1 Construct basic geometric figures.	
		Explain that a geometric construction is made by using only a compass and a straightedge.
		Construct an angle which is complementary, supplementary to a given angle.

TOPIC/CONCEPT	LEARNING OBJECTIVE/OUTCOME	SAMPLE LEARNING ACTIVITY
	The Learner will:	
		Construct a bisector for a given segment or angle.
		Construct a congruent copy of a given angle.
		Construct the perpendicular segment of an angle.
		Divide a segment into a specified number of congruent segments.
9.0 GEOMETRIC PROOFS	9.1 Develop a geometrical argument in the indirect or direct method of proof.	
		Define a geometrical argument and its use.
		Make an appropriate sketch for a given theorem or problem.
		Write a two column proof and a paragraph proof.
		State the essential conditions for making an indirect proof.
		Determine what can be proved from a set of given conditions or what conditions are necessary to establish a conclusion.

TOPIC/CONCEPT	LEARNING OBJECTIVE/OUTCOME	SAMPLE LEARNING ACTIVITY
	The Learner will:	
10.0 CALCULATORS AND COMPUTERS	10.1 Use a computer to solve problems. (See also Secondary Computer Education Curriculum Guide.)	
		Use the vocabulary, definitions and operational procedures associated with computers and their peripherals as appropriate to needs and interests.
	10.2 Use calculating devices to solve problems.	
		Use tables and calculators as tools in solving problems.

TRIGONOMETRY

TOPIC/CONCEPT	LEARNING OBJECTIVE/OUTCOME	SAMPLE LEARNING ACTIVITY
	The Learner will:	
1.0 COMPLEX NUMBERS	1.1 Explain and use complex numbers.	Define the symbol "i" used for imaginary numbers. Define a complex number; define the set of complex numbers. Identify various forms of complex numbers and find equivalent forms. Graph complex numbers in either the rectangular or the polar coordinate system.
2.0 OPERATIONS WITH COMPLEX NUMBERS	2.1 Perform operations with complex numbers.	Define basic operations with complex numbers. Determine absolute value of complex numbers. Simplify powers of "i". Determine conjugates of complex numbers. Simplify expressions with negative radicands. Convert rational complex expressions to standard form. Solve problems involving complex numbers.
3.0 VECTORS	3.1 Apply concepts related to vectors.	Use vector terminology. Solve problems using vectors.

TOPIC/CONCEPT	LEARNING OBJECTIVE/OUTCOME	SAMPLE LEARNING ACTIVITY
	The Learner will:	
4.0 TRIANGLE RELATIONSHIPS	4.1 Apply properties and relationships that exist between triangles.	
		Use congruency theorems to solve problems.
		Apply the Pythagorean Theorem to solve problems.
5.0 POLAR COORDINATES	5.1 Explain and apply the concept that polar coordinates represent points on a plane.	
		Use the relationship between Cartesian and polar coordinate systems to solve problems.
		Convert points/equations from Cartesian to polar coordinates and conversely.
		Graph equations using the polar coordinate system.
		Write equations in polar form.
6.0 RELATIONS AND FUNCTIONS	6.1 Demonstrate concepts related to relations and functions.	
		Determine domain (range) of a linear equation given its range (domain).
		Define relations and function.

TOPIC/CONCEPT	LEARNING OBJECTIVE/OUTCOME	SAMPLE LEARNING ACTIVITY
	The Learner will:	
		Use function notation, concepts of mappings and concepts of even and odd functions to solve problems.
7.0 FUNCTION OPERATIONS AND GRAPHING	7.1 Perform operations with functions, and graph relations and functions.	
		Use standard notation for functions.
		Graph relations in the solution of problems.
		Classify functions as discrete, continuous, 1-1, onto, etc.
		Perform basic arithmetic operations on functions and determine the domain and range of resulting functions.
		Determine the composition of two given functions.
	7.2 Generate the inverse of a function or relation.	
		Define and graph the inverse of a function.
		Determine composition of a function and its inverse.

TOPIC/CONCEPT	LEARNING OBJECTIVE/OUTCOME	SAMPLE LEARNING ACTIVITY
	The Learner will:	
8.0 TRIGONOMETRIC (CIRCULAR) FUNCTIONS	8.1 Explain and apply terminology and properties related to trigonometric (circular) functions.	
		Define trigonometric functions with respect to a right triangle.
		Define trigonometric (circular) functions with respect to a point in the coordinate plane.
		Use the terminology for trigonometric (circular) functions.
		Explain that trigonometric functions are periodic and apply this knowledge to the solution of problems.
		Explain that circular functions are cyclical and apply this knowledge to the solution of problems.
		Find the inverses of the trigonometric functions.
		Use the sign (+, -) relationships of trigonometric functions in each quadrant.
		Use the graphing characteristics of the trigonometric functions.

TOPIC/CONCEPT	LEARNING OBJECTIVE/OUTCOME	SAMPLE LEARNING ACTIVITY
	The Learner will:	
		Use graphs of trigonometric functions to solve problems.
		Sketch a graph of compound trigonometric functions.
		Graph inverse trigonometric functions.
		Use graphic addition involving sine and cosine functions.
	8.2 Solve trigonometric (circular) equations.	
		Simplify trigonometric expressions.
		Determine domain and range of trigonometric functions and their inverses.
		Give values of trigonometric functions for special real numbers.
		Solve right triangle problems using trigonometric functions.
		Use the following: trigonometric identities; trigonometric reduction formulas; trigonometric double angle and half angle formulas; and the circular (trigonometric) sum and difference of two angles formulas.

TOPIC/CONCEPT	LEARNING OBJECTIVE/OUTCOME	SAMPLE LEARNING ACTIVITY
	The Learner will:	
		Use trigonometric tables to approximate desired values.
		Interpolate when using trigonometric tables.
		Solve application problems.
		Solve oblique triangle problems.
9.0 CALCULATORS AND COMPUTERS	9.1 Use common calculating devices to solve problems related to trigonometry.	
		Use math tables and built-in calculator functions to solve trigonometric problems.
	9.2 Use a computer to solve problems.	
		Use the vocabulary, definitions and operational procedures associated with computers and their peripherals as appropriate to needs and interests. (See also Secondary Computer Education Curriculum Guide.)

PRECALCULUS

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TOPIC/CONCEPT	LEARNING OBJECTIVE/OUTCOME	SAMPLE LEARNING ACTIVITY
	The Learner will:	
1.0 NUMBER THEORY	1.1 Demonstrate number theory concepts.	Use exponential notation; perform operations with integer and/or fractional exponents.
2.0 LINEAR EQUATIONS	2.1 Demonstrate and analyze on the basis of the relationship that exists between linear equations and representations in a rectangular coordinate system.	Use the standard form equation of a line in a plane and in space. Determine the equation and slope of a given line. Express linear equations in slope-intercept form. Determine if lines are parallel, perpendicular, coincident or intersecting when given a system of linear equations. Determine the equation for a line given two of its points or given slope and one point or intercept. Determine the slope for a line that is parallel or perpendicular to another line.
3.0 MATHEMATICAL INDUCTION	3.1 Explain and evaluate using mathematical induction.	Prove statements using mathematical induction.

TOPIC/CONCEPT	LEARNING OBJECTIVE/OUTCOME	SAMPLE LEARNING ACTIVITY
	The Learner will:	
4.0 NUMBER SENTENCES	4.1 Analyze a problem situation using a number sentence.	
		Solve compound open sentences containing the connectives "and" and "or".
		Use pictorial or graphic representatives as aids in solving word problems.
		Solve word problems involving more than one step or operation.
		Identify different ways to organize and solve problems.
		Use appropriate formulas to solve problems.
		Determine if a solution fits a given problem.
5.0 PROPERTIES AND THEOREMS OF EQUATIONS	5.1 Classify, synthesize and evaluate equations through their properties, theorems and roots.	
		Classify equations.
		Use the general form of quadratic equations.
		Determine the nature of roots of a quadratic equation.
		Generate a polynomial equation from its roots.

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TOPIC/CONCEPT	LEARNING OBJECTIVE/OUTCOME	SAMPLE LEARNING ACTIVITY
	The Learner will:	
		Use the Fundamental Theorem of Algebra, Remainder Theorem and Rational Root Theorem.
		Use the Binomial Theorem.
6.0 SOLVING EQUATIONS	6.1 Solve equations (quadratic, polynomial, exponential, logarithmic, etc.).	
		Solve quadratic equations.
		Solve equations involving rational expressions.
		Verify the roots of an equation.
		Solve polynomial, exponential, and logarithmic equations.
		Use logarithms to solve power equations.
7.0 NONLINEAR EQUATIONS	7.1 Graph equations.	
		Solve and graph quadratic equations.
		Solve and graph equations involving absolute values.
		Determine whether or not an equation has complex roots.

TOPIC/CONCEPT	LEARNING OBJECTIVE/OUTCOME	SAMPLE LEARNING ACTIVITY
	The Learner will:	
8.0 RELATIONS AND FUNCTIONS	8.1 Use concepts that pertain to relations and functions.	
		Define relation and function.
		Use function notation.
		Use concepts of mappings.
		Determine domain (range) of a linear equation given its range (domain).
		Use concepts of even and odd functions to solve problems.
		Classify functions as continuous, discrete, one-to-one, onto, etc.
9.0 FUNCTION OPERATIONS AND GRAPHING	9.1 Perform operations with functions and graph relations and functions.	
		Graph relations and functions.
		Perform basic arithmetic operations on functions and determine domain and range of resulting functions.
		Determine the composition of functions.

TOPIC/CONCEPT	LEARNING OBJECTIVE/OUTCOME	SAMPLE LEARNING ACTIVITY
	The Learner will:	
10.0 FUNCTIONS	10.1 Generate the inverse of a function or relation.	
		Define and graph the inverse of a given function.
		Determine composition of a function and its inverse.
		Explain that the property of a function and its inverse are symmetric about the line y=x.
	10.2 Graph and find zeros of algebraic functions.	
		Define power and polynomial functions.
		Use graphing to find the zeros of quadratic, polynomial and rational functions.
	10.3 Define, interpret and evaluate exponential functions.	
		Use the laws and properties of exponents.
		Define, evaluate and graph exponential functions.
11.0 SEQUENCES AND SERIES	11.1 Define and use the definitions of and the notations for, sequences.	
		Define and use the notation for arithmetic sequence, infinite sequence and geometric sequence.

TOPIC/CONCEPT	LEARNING OBJECTIVE/OUTCOME	SAMPLE LEARNING ACTIVITY
	The Learner will:	
	11.2 Know how to find missing terms in arithmetic and geometric sequence.	
		Find the general (nth) term of arithmetic and geometric sequences.
		Use formulas for generating missing terms of a sequence.
		Determine the bounds of sequences.
	11.3 Define and apply series.	
		Define series.
		Find the general (nth) term of a series.
		Find the sum of n-terms of a series.
		Use summation notation.
		Use formulas for infinite series.
	11.4 Explain theorems of limits and know how to determine limits of sequence and series.	
		Determine the limits of the following: (1) a series; (2) a function; (3) a convergent sequence; (4) a repeating decimal.
		Apply the theorems of limits.

TOPIC/CONCEPT	LEARNING OBJECTIVE/OUTCOME	SAMPLE LEARNING ACTIVITY
	The Learner will:	
12.0 CALCULATORS AND COMPUTERS	16.1 Use common calculating devices as tools for solving problems.	Use math tables and built-in calculator functions to solve precalculus problems.
	16.2 Use a computer to solve problems.	Use the vocabulary, definitions and operational procedures associated with computers and their peripherals as appropriate to needs and interests. (See also Secondary Computer Education Curriculum Guide.)

CALCULUS

TOPIC/CONCEPT	LEARNING OBJECTIVE/OUTCOME	SAMPLE LEARNING ACTIVITY
	The Learner will:	
1.0 GRAPHS OF LINEAR EQUATIONS	1.1 Apply the relationship that exists between linear equations and representations in a rectangular coordinate system.	
		Use the standard form for equation of a line in a plane and in space.
		Determine the slope of a line.
		Determine the equation of a given line.
		Express linear equations in slope-intercept form.
		Determine if lines are parallel, perpendicular, coincident or intersecting when given a system of linear equations.
		Determine the angle between two intersecting lines or planes.
2.0 SOLVING PROBLEMS	2.1 Solve word problems.	
		Use pictorial or graphic representations as aids in solving problems.
		Distinguish relevant information when solving word problems.
		Solve word problems involving more than one step or operation.

TOPIC/CONCEPT	LEARNING OBJECTIVE/OUTCOME	SAMPLE LEARNING ACTIVITY
	The Learner will:	
		Identify different ways to organize and solve problems.
		Use appropriate formulas to solve problems.
		Determine if a solution fits a given problem.
3.0 SOLVING EQUATIONS	3.1 Solve equations (quadratic, polynomial, exponential, logarithmic, etc.).	
		Solve quadratic and polynomial equations.
		Solve equations involving rational expressions.
		Solve exponential and logarithmic equations.
		Use logarithms to solve power equations.
4.0 SOLVING AND GRAPHING INEQUALITIES	4.1 Solve and graph inequalities.	
		Use properties of inequalities.
		Solve and graph linear and quadratic inequalities.
		Solve and graph inequalities involving absolute value.

TOPIC/CONCEPT	LEARNING OBJECTIVE/OUTCOME	SAMPLE LEARNING ACTIVITY
	The Learner will:	
5.0 RELATIONS AND FUNCTIONS	5.1 Demonstrate concepts related to relations and functions.	
		Determine domain (range) of a linear equation given its range (domain).
		Define relation and function.
		Use function terminology.
		Use concepts of mappings.
		Use concepts of even and odd functions to solve problems.
		Classify functions as discrete, continuous, even, odd, etc.
	5.2 Perform operations with functions and graph relations and functions.	
		Use standard notation for functions.
		Graph relations and functions.
		Perform basic arithmetic operations on functions and determine domain and range of resulting functions.
		Add and subtract functions graphically.
		Determine the composition of functions.

TOPIC/CONCEPT	LEARNING OBJECTIVE/OUTCOME	SAMPLE LEARNING ACTIVITY
	The Learner will:	
	5.3 Generate the inverse of a function or relation.	
		Define and graph the inverse of a function.
		Determine the composition of a function and its inverse.
		Demonstrate that a function and its inverse are symmetric about the line y=x.
	5.4 Define and use exponential functions.	
		Use the laws and properties of exponents.
		Define, evaluate and graph exponential functions.
	5.5 Describe and apply logarithmic functions.	
		Describe a logarithmic function as the inverse of an exponential function and use this to solve problems.
		Determine domain and range of logarithmic functions.
		Graph logarithmic functions.
		Convert exponential functions to logarithmic functions.
		Describe and use the properties of logarithmic functions.

TOPIC/CONCEPT	LEARNING OBJECTIVE/OUTCOME	SAMPLE LEARNING ACTIVITY
	The Learner will:	
	5.6 Define terminology and apply properties related to trigonometric (circular) functions.	
		Define trigonometric functions with respect to a right triangle.
		Define trigonometric (circular) functions with respect to a point in the coordinate plane.
		Describe and use the terminology for trigonometric (circular) functions.
		Apply the periodics of trigonometric functions in the solution of problems.
		Explain that circular functions are cyclical and apply this knowledge to the solution of problems.
		Find the inverses of the trigonometric functions.
	5.7 Solve trigonometric (circular) equations.	
		Simplify trigonometric expressions.
		Determine domain and range of trigonometric functions.

TOPIC/CONCEPT	LEARNING OBJECTIVE/OUTCOME	SAMPLE LEARNING ACTIVITY
	The Learner will:	
		Give the values of trigonometric functions for the special cases.
		Solve right triangle problems using trigonometric functions.
	5.8 Demonstrate the capabilities of trigonometric (circular) functions.	
		Use the basic circular (trigonometric) identities to solve problems.
		Use the circular (trigonometric) reduction formulas to solve problems.
		Use the circular (trigonometric) double angle and half angle formulas to solve problems.
		Use the circular (trigonometric) formulas for sum and differences of two angles to solve problems.
6.0 LIMITS	6.1 Identify and demonstrate concepts and theorems related to limits.	
		Determine the limit of a function.
		Describe the theorem of limits, concept of nonexistent lines and two-sided limits.
		Define continuity and apply continuity theorems.

TOPIC/CONCEPT	LEARNING OBJECTIVE/OUTCOME	SAMPLE LEARNING ACTIVITY
	The Learner will:	
7.0 DIFFERENTIAL CALCULUS	7.1 Apply the the concepts of differentiation and derivatives of functions.	
		Use the definitions of the derivative.
		Use notation for differentiation.
		Find derivatives of algebraic, trigonometric, exponential, and logarithmic functions.
		Find derivatives of functions that involve sums, products, and quotients.
		Find the derivative of a composite function (chain rule).
		Find the derivative of an implicitly defined function.
		Find the derivative of the inverse of a function (including Arcsin x and Actan x).
		Perform logarithmic differentiation.
		Find derivatives of higher order.
		Contrast differentiability and continuity.
		Use l'Hopital's rule (quotient indeterminate forms).

TOPIC/CONCEPT	LEARNING OBJECTIVE/OUTCOME	SAMPLE LEARNING ACTIVITY
	The Learner will:	
	7.2 Solve problems related to derivatives of functions.	
		Find slope of a curve.
		Find tangent and normal lines to a curve (including linear approximations); determine point at which line is tangent to a curve.
		Sketch curves including: increasing and decreasing functions; relative and absolute maximum and minimum points; concavity; points of inflection.
		Solve extreme value problems.
		Find velocity and acceleration of a particle moving along a line.
		Find related rates of change.
		Find average and instantaneous rates of change.
8.0 INTEGRAL CALCULUS	8.1 Apply the concepts of integration and integrals of functions.	
		Use the definition of "integration" as it relates to the calculus.
		Use notation for integration.

TOPIC/CONCEPT	LEARNING OBJECTIVE/OUTCOME	SAMPLE LEARNING ACTIVITY
	The Learner will:	
		Describe differentiation and integration as inverse operations.
		Find integrals of algebraic, trigonometric, exponential and logarithmic functions.
		Integrate by substitution (use of identities, change of variable).
		Perform simple integration by parts.
		Use the concept of the definite integral as an area.
		Approximate the definite integral by using rectangles.
		Use the definition of the definite integral as the limit of a sum.
		Use the properties of the definite integral.
	8.2 Solve problems related to integrals of functions.	
		Find distance and velocity from acceleration with initial conditions.
		Find solutions of $y^1 = ky$ and applications to growth and decay.

TOPIC/CONCEPT	LEARNING OBJECTIVE/OUTCOME	SAMPLE LEARNING ACTIVITY
	The Learner will:	
		Find average (mean) value of a function on an interval.
		Find the area between curves.
		Find the volume of a solid of revolution (disc, washer, and shell methods) about the X- and Y-axes or lines parallel to the axes.
9.0 CALCULATORS AND COMPUTERS	9.1 Use common calculating devices to solve problems related to calculus.	
		Use math tables and built-in calculator functions to solve calculus problems.
	9.2 Use a computer to solve problems.	
		Use the vocabulary, definitions and operational procedures associated with computers and their peripherals as appropriate to needs and interests. (See also Secondary Computer Education Curriculum Guide.)

HISTOGRAMS

ACKNOWLEDGEMENTS (Editions I/II)

MODEL
CURRICULUM
GUIDE
PROJECT

Subject: Mathematics
Course: General Math
Level: Secondary
Grade(s):
Date: 6/26/86

PERCENTAGE OF
EDUCATIONAL OUTCOMES

Objective	N	%	Histogram of Percentages (10 20 30 40 50 60 70 80 90 100)
COGNITIVE			
1.10 Knowledge of specifics	0	0	
1.20 Knowledge of ways and means of dealing with specifics	0	0	
1.30 Knowledge of universals and abstractions	0	0	
2.00 Comprehension	5	19	**********
3.00 Application	20	77	**
4.00 Analysis	1	4	**
5.00 Synthesis	0	0	
6.00 Evaluation	0	0	
SUBTOTAL	26	100	
AFFECTIVE	0	0	
PSYCHOMOTOR	0	0	
Not Classifiable	0	0	
TOTAL	26	100	

ALASKA MODEL CURRICULUM GUIDES

HISTOGRAM

This histogram of the cognitive levels of the learning objectives/outcomes is provided for the Alaska Model Curriculum Guides. The histogram is a bar graph that shows the percentages of objectives at each different cognitive level, adapted from Bloom's Taxonomy of Cognitive Levels. It provides a way to look at and understand the different "levels" of thinking required to accomplish a particular objective.

Thinking skills must be taught and reviewed to ensure something beyond the mere recall of facts. Every objective in the guides was analyzed and assigned a number indicating its cognitive level and tallied. The histogram indicates where the emphasis is within the cognitive level.

There is no ideal distribution we can use for a model, but it provides a source for professional judgement about the learning objectives/ outcomes. The histogram does not necessarily show what ought to be, but rather reflects what is in this particular set of concepts promoted in the curriculum guides for school districts in Alaska.

MODEL
CURRICULUM
GUIDE
PROJECT

Subject: Mathematics
Course: Consumer Math
Level: Secondary
Grade(s):
Date: 6/26/86

PERCENTAGE OF
EDUCATIONAL OUTCOMES

Objective	N	%	Histogram of Percentages (10 20 30 40 50 60 70 80 90 100)
COGNITIVE			
1.10 Knowledge of specifics	0	0	
1.20 Knowledge of ways and means of dealing with specifics	0	0	
1.30 Knowledge of universals and abstractions	0	0	
2.00 Comprehension	4	18	*********
3.00 Application	16	73	**********
4.00 Analysis	1	5	***
5.00 Synthesis	0	0	
6.00 Evaluation	1	5	***
SUBTOTAL	22	100	
AFFECTIVE	0	0	
PSYCHOMOTOR	0	0	
Not Classifiable	0	0	
TOTAL	22	100	

ALASKA MODEL CURRICULUM GUIDES

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MODEL
CURRICULUM
GUIDE
PROJECT

Subject: Mathematics
Course: Pre-algebra
Level: Secondary
Grade(s):
Date: 6/26/86

PERCENTAGE OF EDUCATIONAL OUTCOMES

Objective	N	%	Histogram of Percentages (10 20 30 40 50 60 70 80 90 100)
COGNITIVE			
1.10 Knowledge of specifics	0	0	
1.20 Knowledge of ways and means of dealing with specifics	0	0	
1.30 Knowledge of universals and abstractions	0	0	
2.00 Comprehension	3	15	********
3.00 Application	15	75	**
4.00 Analysis	1	5	***
5.00 Synthesis	0	0	
6.00 Evaluation	1	5	***
SUBTOTAL	20	100	
AFFECTIVE	0	0	
PSYCHOMOTOR	0	0	
Not Classifiable	0	0	
TOTAL	20	100	

ALASKA MODEL CURRICULUM GUIDES

HISTOGRAM

This histogram of the cognitive levels of the learning objectives/outcomes is provided for the Alaska Model Curriculum Guides. The histogram is a bar graph that shows the percentages of objectives at each different cognitive level, adapted from Bloom's Taxonomy of Cognitive Levels. It provides a way to look at and understand the different "levels" of thinking required to accomplish a particular objective.

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MODEL
CURRICULUM
GUIDE
PROJECT

Subject: Mathematics
Course: Algrebra I
Level: Secondary
Grade(s):
Date: 6/26/86

PERCENTAGE OF
EDUCATIONAL OUTCOMES

Objective	N	%	Histogram of Percentages (10 20 30 40 50 60 70 80 90 100)
COGNITIVE			
1.10 Knowledge of specifics	1	2	*
1.20 Knowledge of ways and means of dealing with specifics	1	2	*
1.30 Knowledge of universals and abstractions	0	0	
2.00 Comprehension	33	70	**********
3.00 Application	6	13	*******
4.00 Analysis	6	13	*******
5.00 Synthesis	0	0	
6.00 Evaluation	0	0	
SUBTOTAL	47	100	
AFFECTIVE	0	0	
PSYCHOMOTOR	0	0	
Not Classifiable	0	0	
TOTAL	47	100	

ALASKA MODEL CURRICULUM GUIDES

HISTOGRAM

This histogram of the coghitive levels of the learning objectives/outcomes is provided for the Alaska Model Curriculum Guides. The histogram is a bar graph that shows the percentages of objectives at each different cognitive level, adapted from Bloom's Taxonomy of Cognitive Levels. It provides a way to look at and understand the different "levels" of thinking required to accomplish a particular objective.

Thinking skills must be taught and reviewed to ensure something beyond the mere recall of facts. Every objective in the guides was analyzed and assigned a number indicating its cognitive level and tallied. The histogram indicates where the emphasis is within the cognitive level.

There is no ideal distribution we can use for a model, but it provides a source for professional judgement about the learning objectives/ outcomes. The histogram does not necessarily show what ought to be, but rather reflects what is in this particular set of concepts promoted in the curriculum guides for school districts in Alaska.

MODEL
CURRICULUM
GUIDE
PROJECT

Subject: Mathematics
Course: Geometry
Level: Secondary
Grade(s):
Date: 6/26/86

PERCENTAGE OF
EDUCATIONAL OUTCOMES

Objective	N	%	Histogram of Percentages (10 20 30 40 50 60 70 80 90 100)
COGNITIVE			
1.10 Knowledge of specifics	1	5	***
1.20 Knowledge of ways and means of dealing with specifics	3	14	*******
1.30 Knowledge of universals and abstractions	0	0	
2.00 Comprehension	13	62	**********
3.00 Application	4	19	**********
4.00 Analysis	0	0	
5.00 Synthesis	0	0	
6.00 Evaluation	0	0	
SUBTOTAL	21	100	
AFFECTIVE	0	0	
PSYCHOMOTOR	0	0	
Not Classifiable	0	0	
TOTAL	21	100	

ALASKA MODEL CURRICULUM GUIDES

HISTOGRAM

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Thinking skills must be taught and reviewed to ensure something beyond the mere recall of facts. Every objective in the guides was analyzed and assigned a number indicating its cognitive level and tallied. The histogram indicates where the emphasis is within the cognitive level.

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MODEL
CURRICULUM
GUIDE
PROJECT

Subject: Mathematics
Course: Trigonometry
Level: Secondary
Grade(s):
Date: 6/26/86

PERCENTAGE OF
EDUCATIONAL OUTCOMES

Objective	N	%	Histogram of Percentages (10 20 30 40 50 60 70 80 90 100)
COGNITIVE			
1.10 Knowledge of specifics	0	0	
1.20 Knowledge of ways and means of dealing with specifics	1	8	****
1.30 Knowledge of universals and abstractions	1	8	****
2.00 Comprehension	3	25	**********
3.00 Application	6	50	**********
4.00 Analysis	1	8	****
5.00 Synthesis	0	0	
6.00 Evaluation	0	0	
SUBTOTAL	12	100	
AFFECTIVE	0	0	
PSYCHOMOTOR	0	0	
Not Classifiable	0	0	
TOTAL	12	100	

ALASKA MODEL CURRICULUM GUIDES

HISTOGRAM

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MODEL
CURRICULUM
GUIDE
PROJECT

Subject: Mathematics
Course: Pre-calculus
Level: Secondary
Grade(s):
Date: 6/26/86

PERCENTAGE OF
EDUCATIONAL OUTCOMES

Objective	N	%	Histogram of Percentages (10 20 30 40 50 60 70 80 90 100)
COGNITIVE			
1.10 Knowledge of specifics	0	0	
1.20 Knowledge of ways and means of dealing with specifics	0	0	
1.30 Knowledge of universals and abstractions	0	0	
2.00 Comprehension	8	40	**********
3.00 Application	8	40	**********
4.00 Analysis	4	20	**********
5.00 Synthesis	0	0	
6.00 Evaluation	0	0	
SUBTOTAL	20	100	
AFFECTIVE	0	0	
PSYCHOMOTOR	0	0	
Not Classifiable	0	0	
TOTAL	20	100	

ALASKA MODEL CURRICULUM GUIDES

HISTOGRAM

This histogram of the cognitive levels of the learning objectives/outcomes is provided for the Alaska Model Curriculum Guides. The histogram is a bar graph that shows the percentages of objectives at each different cognitive level, adapted from Bloom's Taxonomy of Cognitive Levels. It provides a way to look at and understand the different "levels" of thinking required to accomplish a particular objective.

Thinking skills must be taught and reviewed to ensure something beyond the mere recall of facts. Every objective in the guides was analyzed and assigned a number indicating its cognitive level and tallied. The histogram indicates where the emphasis is within the cognitive level.

There is no ideal distribution we can use for a model, but it provides a source for professional judgement about the learning objectives/outcomes. The histogram does not necessarily show what ought to be, but rather reflects what is in this particular set of concepts promoted in the curriculum guides for school districts in Alaska.

MODEL
CURRICULUM
GUIDE
PROJECT

Subject: Mathematics
Course: Calculus
Level: Secondary
Grade(s):
Date: 6/26/86

PERCENTAGE OF EDUCATIONAL OUTCOMES

Objective	N	%	Histogram of Percentages (10 20 30 40 50 60 70 80 90 100)
COGNITIVE			
1.10 Knowledge of specifics	0	0	
1.20 Knowledge of ways and means of dealing with specifics	0	0	
1.30 Knowledge of universals and abstractions	1	5	***
2.00 Comprehension	9	47	**********
3.00 Application	8	42	**********
4.00 Analysis	1	5	***
5.00 Synthesis	0	0	
6.00 Evaluation	0	0	
SUBTOTAL	19	100	
AFFECTIVE	0	0	
PSYCHOMOTOR	0	0	
Not Classifiable	0	0	
TOTAL	19	100	

ALASKA MODEL CURRICULUM GUIDES

HISTOGRAM

This histogram of the cognitive levels of the learning objectives/outcomes is provided for the Alaska Model Curriculum Guides. The histogram is a bar graph that shows the percentages of objectives at each different cognitive level, adapted from Bloom's Taxonomy of Cognitive Levels. It provides a way to look at and understand the different "levels" of thinking required to accomplish a particular objective.

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ACKNOWLEDGEMENTS

FIRST EDITION

1985

In preparing the Model Curriculum Guide Series, the Department of Education requested and received copies of curriculum materials from school districts in Alaska, and other state departments of education. The department thanks the following school districts and state departments for submitting materials:

Alaska School Districts

Adak
Anchorage
Annette Island
Bristol Bay
Copper River
Cordova
Craig
Delta/Greely
Fairbanks
Galena
Haines
Iditarod
Kenai Peninsula
Ketchikan
Klawock
Lower Kuskokwim
Lower Yukon
Matanuska-Susitna
Nenana
Nome
North Slope
Northwest Arctic
Pelican
Railbelt
Valdez
Yakutat

State Departments of Education

Alabama
Arizona
Arkansas
California
Connecticut
Delaware
Florida
Idaho
Illinois
Indiana
Maine
Minnesota
Maryland
Nebraska
Nevada
New Mexico
New York
North Carolina
Oregon
Rhode Island
South Carolina
South Dakota
Tennessee
Texas
Utah
Vermont
Virginia
West Virginia
Virgin Islands
Guam

The department appreciates the efforts of its staff, Freda Braley, Karen Doxey, Roy Henderson, Margaret MacKinnon, and Richard Spaziani, who reviewed and synthesized specific content area materials which resulted in the first draft of the Secondary Mathematics Curriculum Guide. The department also appreciates the efforts of members of the Alaska Council of Teachers of Mathematics (ACTM) who reviewed and critiqued earlier drafts of this Model Curriculum. Working within very tight timelines, they provided useful and helpful suggestions for how the document could be improved. Individuals involved include:

Doris Ayres, Eagle River
Dwayne Craig, Kenai
Cheryl Girradot, Palmer
Flo Larson, Kenai
Daryl Mannausa, Soldotna
Alicia Newman, Anchorage
Dennis Ostrander, Soldotna
Louise Peterman, Anchorage
James Seitz, Anchorage
James Simeroth, Kenai
Holly Stephans, Palmer
Caroline Valentine, Anchorage
Virginia Walters, Kenai
Dorothy Zarelli, Eagle River

In addition, individuals who contributed their time to a review of the 1984 draft of the Secondary Mathematics Guide include:

Holly Stephans, A.C.T.M.
Louise Petermann, A.C.T.M.
Marla Trible, Centralized Correspondence Study

The Northwest Laboratory's consultant for the 1985 Elementary Mathematics Guide was Leslie Crohn. Dr. Shirley A. Hill, University of Missouri, Kansas City, was content consultant to the team. Dr. Dana Davidson was consultant on matters of child development. Project design and management was by Dr. William G. Savard of NWREL's Assessment and Evaluation Program. Dr. Gary Estes provided overall direction.

ACKNOWLEDGEMENTS

SECOND EDITION

1986

The department appreciates the efforts of the individual educators and professional associations who reviewed and commented on the First Edition of the Secondary Mathematics Curriculum Guide. Their comments form the basis of the 1986 Model Secondary Mathematics Curriculum Guide. People and organizations who shared their time and expertise include:

Doug Bruce
President
AK Foreign Language Association
Fairbanks, Alaska

Anne Fuller
AK Natural Resource and
Outdoor Education Association
Juneau, Alaska

Donna York, President
Larry Read
Tom Sheets
Virginia Johnson
Rick Houghton
Deborah Pomeroy
Larry Klawunder
AK Science Teachers Association

Hannah Geneaux
Fairbanks North Star Borough
School District
Fairbanks, Alaska

Rich Carlson
Director of Curriculum
Bering Straits School District
Unalakleet, Alaska

Sandy Burgess
Principal
Northwest Arctic School District
Noatak, Alaska

Sharron Lobaugh
Sex Equity Consultant
Northwest Regional Education Laboratory

Pat Rudzika
Northwest Regional Education Laboratory
Portland, Oregon